tion of non-corrosiveness in the example, from ductile materials without major regard to their strength, for the reason that during the rolling and heating operation, an alloy structure results by the diffusion, with increase of strength. The claddings **52** can likewise be chromium or stainless steel, when a welding film of nickel or copper is present between the surfaces to be welded together. When the claddings **56** are of such metals, it is also the practice to interpose a welding film by plating or as a foil. Titanium and other metals and alloys can likewise be used for cladding. Illustratively the total assembly thickness for the billet may be 8 inches, with internal cladding layers of ¼ inch, for example. Upon rolling, the final strip thickness can be about 0.012 inch, with two lamination layers of about 0.006 inch thick separated from one another at each channel by the residue of the anti-welding material. Therewith the total reduction from 8 inches to 0.012 inch is about 640:1, and the cladding layers have been reduced to about 0.00005 inch each, wherewith the more expensive cladding material is economically employed.

As a further example, the body layers **57** are of carbon steel 9 inches thick, the inner facings 52 are ½ inch thick at the floors of the channels **55** with ¼ inch projections at the lands **53, 54** and the outer facings **56** are ½ inch thick. The facings **52, 56** are of 18–8 or Type 304 stainless steel with a thin nickel-electroplate superimposed. Upon assembling and with use of aluminum oxide or equivalent anti-weld compound in the channels as anti-welding material, the composite is hot rolled for roll-bonding, and hot and cold rolling is then employed for reduction to a final thickness of 0.010 inch total. When such a laminate stock is opened out, as described below, the tubing has a total wall thickness of 0.005 inch, with the internal and external surfaces provided by stainless steel fixedly joined to the metal body by diffusion interfaces, and representing about 0.00025 inch thickness at each surface.

In preparing billets by the assemblies of FIGURES 5 and 6, the edges can be connected as before, e.g. by tack welding.

External cladding as at **56**, FIG. 6, may be added. With the last example above, top and bottom elements of ¼ inch stainless steel can be added to the pack. The assembly is rolled, with bonding of the five elements, to a final thickness of 0.012 inch. Upon opening out, the tubing has a wall thickness of 0.006 inch, with 0.00025 inch cladding of stainless steel both inside and outside.

Various anti-welding materials may be employed such as the aluminum oxide, chromium oxide and other powders proposed in the art. Other materials useful for anti-welding core purposes are calcined gypsum, zinc oxide, powdered talc and powdered or finely flaked mica. Talc should not be employed with steel which is to be heat-soaked or hot rolled at the usual temperatures of steel: because it decomposes at such temperatures. Graphite can be used, except where it may diffuse into and undesirably change the character of the abutting metal, e.g. with steel and stainless steel, or where its residue may later provide an electrolytic couple. When powders are to be deposited in the channels before assembly, they preferably are deposited as thick slurries in an evaporable liquid, dried, baked, and then cut as necessary to the desired thickness. Such deposits, into accurately pre-formed channels, assures a maximum density and uniformity after drying and the absence of major empty spaces, e.g. adjacent the regions where roll-bonding of metal to metal is accomplished. In practice, slurry deposits exhibit a greater density than powder deposits, even with vibration or jigging, and the preparation of a resist or anti-welding mass in such a pre-formed channel permits a quick drying and expulsion of the volatile vehicle, compared to the difficulties and long times required for drying slurries which have been deposited into closed channels such as those provided in cast ingots.

With these various forms, the product upon roll-bonding has its metal parts welded together and enclosing the space or spaces for anti-welding material as shown by FIGURE 7, in which the lower layer **60** is bonded to the upper layer **64** at the portions **62, 63** provided by the lands of the initial stock elements; and the anti-welding material AW occupies the channel spaces.

As described above, the ends may be closed by the plates **16**, FIGURE 8.

During rolling to final thickness, the laminate stock is elongated substantially without change of width, with the metal and anti-weld material thicknesses being decreased proportionately to one another, since the anti-welding material elongates and continues its interposition between the metal at the channels, to form a thin strip, FIGURE 9, which is like that of FIGURE 7, except for the reduction of thickness. This strip can then be cut transversely to expose one or both ends, and then the non-welded areas of the upper and lower laminae can be moved apart to form the opened or expanded tubing. In FIGURE 9, the dotted lines **70, 71**, show that the strip can be severed transversely and longitudinally to provide short individual blanks which, when opened, become the tubular bodies **73** of FIGURE 10, and can be employed in making containers.

In general, the hot working temperatures for soaking, hot-rolling, and other hot operations referred to above, are as usual based upon the melting point of the material, and not upon the mere presence of a heat condition above room temperature. For example, such operations can be conducted at about two-thirds of the melting point temperature, expressed in degrees absolute.

The invention is not limited to the illustrative practices, and can be employed in many ways within the scope of the appended claims.

We claim:

1. The method of preparing a structure having metal laminations separated by a layer of anti-welding material with the laminations integrally joined metal-to-metal at the edges of said layer, which comprises preparing a first metal slab with a longitudinally extending channel, contact land areas located laterally from the channel with spaces therebetween, and upwardly projecting longitudinal ribs in the spaces between the contact land areas and the channel, the ribs having convergently beveled side surfaces; placing an extensible anti-welding material in the channel with its exposed surface spaced below the plane of the tops of said ribs; preparing a second metal slab with longitudinal grooves conformed in location with the said ribs and having beveled side walls for contacting the sides of the ribs and having contact land areas laterally outside said grooves, bringing the slabs together so that the ribs are received in and fill the grooves and the contact land areas of the slabs are engaged with one another; heating the slabs, and exerting forces upon the outer surfaces of the slabs for effecting welding of the slabs at said contact land areas and between the surfaces of said ribs and grooves.

2. The method of preparing a structure having metal laminations separated by a layer of anti-welding material with the laminations integrally joined metal-to-metal at the edges of said layer, which comprises preparing a first metal slab with a depression and upwardly projecting ribs at margins of the depression and contact land areas laterally outside the ribs, placing an extensible anti-welding material in the depression with its exposed surface spaced below the plane of the tops of the ribs, preparing a second metal slab with grooves conformed in location with the said ribs and with contact land areas laterally outside the grooves, said ribs and grooves having beveled side walls above the level of the anti-welding material for conforming contact and engagement with the ribs filling the grooves, bringing the slabs